Activity Report of the St. Andrews Biological Station (1986)

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ACTIVITY REPORT OF THE ST. ANDREWS BIOLOGICAL STATION (1986)

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ABSTRACT

Sander, F. 1987. Activity Report of the St. Andrews Biological Station (1986). Can. MS Rep. Fish. Aquat. Sci. 1948: iii + 9 p.

This report contains a brief description of research findings at the St. Andrews Biological Station in 1986 and listings of Station staff, seminars presented and publications emanating from the various research activities of the three component Divisions.

RÉSUMÉ

Sander, F. 1987. Activity Report of the St. Andrews Biological Station (1986). Can. MS Rep. Fish. Aquat. Sci. 1948: iii + 9 p.

Ce rapport contient une brève description des résultats de recherches scientifiques à la Station de biologie de St. Andrews en 1986, et listes des employés, des colloques présentés et des publications provenant des diverses activités de nos trois divisions.

RESEARCH FINDINGS

The following are brief descriptions of highlights of research findings achieved at the Biological Station in 1986.

FISHERIES AND ENVIRONMENTAL SCIENCES DIVISION

A wide spectrum of research endeavors were undertaken in the Division's Habitat and Applied Fisheries Physiology Sections at St. Andrews in 1986. "Tainted" salmon from the Salmon River at Truro, N.S., were analyzed and found to contain di-, tri-, and tetra-chlorobenzenes and biphenyl. Some of these chemicals are used at the Stanfield garment factory. Sediments in the area were found to be contaminated by PAH, very likely originating from the Domtar wood-preserving plant. The information will prove useful when steps are considered to clean up the area.

Nominal 96-h LC50 of the dichlorvos formulation NUVAN, used to control sea lice in Atlantic salmon aquaculture, was measured at 1.1 mg/L. Dichlorvos itself is less toxic (2.3 mg/L). The formulation should be subjected to the usual registration process. A method for determination of acetylcholinesterase (ACHE) activity became operational and was used on Atlantic salmon exposed to dichlorvos.

Risk of 110 pesticides used in agriculture on P.E.I. was assessed by a fugacity model. Organophosphates and pyrethroids were determined to pose the highest risk.

Concentration of lactic acid in the white muscle of Atlantic salmon was determined to be a good indicator of "capture stress" and will be used routinely as a part of a set of biochemical indicators of health.

Analysis of 5 yr of data on the distribution and abundance of toxic dinoflagellates in the Bay of Fundy revealed several areas of high Gonyaulax abundance. Occurrence of high concentrations in frontal zones was suspected. There was no valid correlation between abundance of toxic dinoflagellates and temperature or salinity. Anatomical distribution of paralytic shellfish toxins in soft-shell clams from one of the prime shellfish areas in southwestern New Brunswick affected with this problem indicated that about 75% of the toxin load is confined to a small portion of the viscera in the vicinity of the brown gland, 10% to the digestive gland and 10% to the gills. Muscular tissues contain very low, or undetectable, amounts of the toxins. Toxin content was determined by bioassay and HPLC.

Behavioral observations of giant scallops placed in bottom culture adjacent to the Biological Station were completed with a Lobsiger time-lapse camera. Over 1000 exposures were obtained for analysis. Experiments on the effect of flow velocity on scallop feeding suggest that ambient flows inhibit feeding at flows >10-16 $cm^{-1}s^{-1}$ and growth at >10 $cm^{-1}s^{-1}$.

Intermolt mating in lobsters was shown to be more common than previously thought. Initially, 32 such matings were recorded and 14 of the females spawned and produced fertile eggs. These matings occurred without the courtship behavior described for newly molted female lobsters. It appears that intermolt mating may, therefore, be a mechanism for ensuring the insemination of unmated preovigerous female lobsters. This success of intermolt mating of these females has eliminated the problem of having to be present each time a female molts. It has the advantage over artificial insemination in that egg retention is not affected.

Poor egg retention by cultured female lobsters has prevented significant progress in the development of genetically improved strains of lobsters. With environmental manipulation, egg attachment and retention rates in cultured females close to that obtained with wild stock were obtained. This manipulation required 5-7 yr beyond the age of maturity, making this a unique study.

It has been known for some time that there is a threshold size for the parr-smolt transformation in juvenile Atlantic salmon. This was thought to be about 10 cm. One important physiological development during smolting is the attainment of salinity tolerance. The enzyme, gill Na^+-K^+ ATPase, is believed to be directly involved in transport of Na^+ and Cl^- across the gill membranes. Studies showed that the imposition of artificially long-day length during winter resulted, after less than a month, in a sharp increase in ATPase activity in salmon greater than 15 cm in length. Smaller salmon showed no such response. This is clear evidence in support of a threshold-size hypothesis.

Exposure to 16-h day length from September 21 to December 21 greatly enhanced growth of presmolt salmon. Following return to normal photoperiod in late December, the salmon underwent smoltification. Although such treatment resulted in slightly later completion of smolting, the fish survived transfer to sea water and grew nearly as well as controls. Such photoperiod manipulation, with minor modifications, should be of great benefit to smolt culture, resulting in more 1+ smolts of larger size.

Arteriosclerotic lesions in coronary arteries of Atlantic salmon are rare in juveniles in fresh water, but increase rapidly in number and severity during the marine stage. Lesion development appears to be related more to growth rate than to fish size. An experiment showed that lesions do not regress during recovery of post-spawned salmon (kelts).

The stream invertebrate component of the LRTAP biomonitoring program was completed for the nine streams selected for monitoring in the Scotia-Fundy region. The streams ranged from 4.3 to 6.0 in pH. The observations on the behavior of various species of freshwater fish in gradients of pH were continued. Most species of freshwater fish tested in a linear spatial pH gradient avoided pH levels lower than 5.3-5.5. Some also exhibited avoidance of high pH (ca. 8.5-9.0), while others showed no avoidance of pH levels as high as 10.0. Yellow perch preferred more acidic water than did the other species tested, and showed avoidance behavior only to pH less than 4.0.

A study of aluminum speciation in acid rivers of Nova Scotia evaluated existing methods of aluminum speciation and developed modifications to apply to acidic waters from Nova Scotia. Aluminum speciation in the salmon rivers of Nova Scotia was found to differ from the established patterns for

other regions during acidity episodes. Organic, non-labile forms of aluminum were dominant, and the study indicated that inorganic aluminum is not the lethal factor in these brownwater streams.

Density and biomass estimates for juvenile salmon and other species were also successfully completed in 20 Nova Scotia streams representing a wide range of chemical conditions.

MARINE FISH DIVISION

1986 saw a continuation of the increasing research and stock assessment effort of the Marine Fish Division. St. Andrews staff had special responsibility for assessments of stocks of herring, haddock and cod in Bay of Fundy-Gulf of Maine-Georges Bank area (NAFO Divs. 4X, 5YZ) in addition to flatfish and cod on the Scotian Shelf.

Considerable changes in "standard" groundfish survey operations included new procedures, which minimized data recording at sea and data editing and entry ashore. The annual summer survey of the Scotian Shelf and Bay of Fundy, using the Alfred Needler and instituted in 1970, was completed. The series of seasonal (March and October) surveys of the Shelf, started in 1979, was terminated and replaced by more limited surveys, with special interest in cod and haddock: a standard survey of Georges Bank was initiated in March and a survey concentrated on the central and northeast Scotian Shelf was completed in October. The annual larval herring survey of the Bay of Fundy was also carried out in October, the 17th in this series, and was supplemented by surveys for juvenile herring using the J. L. Hart.

The herring acoustic survey in the Chedabucto Bay area in January identified large concentrations of herring in the Bay which yielded estimates of abundance 2-3 times greater than in previous years. This was the 4th year of the survey in the area. The project is aimed at developing the methodology to produce accurate estimates of abundance of herring.

A review of the management history of the Canada/U.S. boundary stocks discussions produced convincing evidence against movements of herring from the Scotian Shelf and Bay of Fundy into the Gulf of Maine. The source(s) of the young herring which support the weir fisheries in the Bay of Fundy have not been fully determined. Conservation of stocks is dependent on detailed knowledge of the origin, life history, development and seasonal movements of the fish, and the delineation and structure of the stocks. Intensive stock discrimination studies on herring included special studies on spawning stocks including comparative work on morphometrics, meristics and parasites. At the same time, the larger issues of what factors determine the temporal and spatial distributions, the strengths of populations and growth and development of herring on a global basis are being critically examined.

St. Andrews scientists have taken a special interest in the biology of the juvenile stages of gadids, particularly in their first year of life. This stage has received comparatively little attention, although it is identified as a period in which year-class strength and mortality may determine recruitment to the fisheries. Studies in this field range from laboratory hatching and rearing of larvae to examine effects of predation and nutrition, to field studies of the behavior and distribution of young fish in relation to the hydrographic features of the water column. A special survey cruise for juvenile gadids in June included studies of feeding behavior, distribution, comparative fishing experiments with the U.S. research vessel Albatross and observations of bottom habitat preferences from a submersible. The observations showed that depth distributions of the young fish varied over time, a factor to be considered in designing surveys. Examination of the relationships of the ectoparasite Caligus sp. to young gadids showed differential distributions on cod and haddock and potential effects of the parasite on survival and vulnerability to predation in the fish.

Special studies were also made of flatfish egg and larval distributions, in order to determine timing and distribution of spawning. The flatfishes are an important resource on the Scotian Shelf but have been largely neglected both from the biological and stock assessment aspects. To complicate matters, the various species have not been differentiated either in commercial landings or in assessments. The special interest now being given them should rectify this situation and, at the same time, produce basic biological information both for life-history studies and as a foundation for stock conservations. Relevant to this is the special concern now being given to halibut both as a valuable resource requiring protection and as a viable candidate for marine aquaculture.

Collection of live fish at sea was greatly facilitated by installation of a sophisticated live-holding facility on the Lady Hammond. This will greatly improve the Department's capability to bring fish back to the laboratory for experimental work on effects of nutrition on growth and fecundity. The results are of interest both in relation to the health and development of fish in the wild and to aquaculture of marine species in laboratory or field conditions.

The increasing field programs place a great strain on personnel resources, with virtually every eligible member of staff serving for 2 wk or more in the summer period, a total of more than 1,000 person days. In addition, management-related activities, supported by extensive sampling and ageing services, absorbed much time and effort. They included attendance at routine CAFSAC and NAFO assessment meetings, the Herring Advisory Committee, Canada/U.S. scientific meetings, the DFO-Industry Committee on halibut and the Herring Weirmen's Association.

INVERTEBRATE AND MARINE PLANTS DIVISION

A search for an amicable solution to the conflict within the lobster fishery of LFA 34 (southwest Nova Scotia) continued. A working group of the local advisory committee held numerous meetings at which all available information on the topic was reviewed. The basic problem was that a group of lobster fishermen residing in the area wanted to expand their fishing effort. Biological advice recommended holding any expansion in fishing, at least until the source of recruitment is resolved for the inshore stocks. The increased effort is aimed at the middle grounds (40 km to 80 km from shore), a possible refuge-in-space for the inshore brood stock. To help solve this problem, a lobster

tagging study was undertaken during September, 1986, in three locations: German Bank, the Gully (mid-shore), and the inshore area. However, results have not yet been analyzed. In addition, a long-term juvenile lobster study off McNutt's Island, Shelburne County, was continued. The study has shown that the average density of juvenile lobsters has declined and that the mean size remained unchanged from last year.

In response to a request from St. Mary's Bay (LFA 34) lobster fishermen, an assessment of the impact of scallop dragging on lobsters was undertaken during July, 1986. A total of 5014 m^2 of bottom area was surveyed by SCUBA divers in the shallower upper half of St. Mary's Bay. The data suggested that there was no major impact on lobster stocks by dragging for scallops.

In 1986, scallop spat collecting experiments to determine both starfish settlement time and scallop spat settlement continued. It is believed that there may be a starfish-scallop predation parameter in the recruitment question. For the first time, a substantial number of scallops in the 500- to 1000-micron range was captured. Settlement appeared to be very good. However, a paradox existed. Examination of scallop gonads from Tongue Shoal indicated a later spawning than in 1985, but settlement appeared to have been earlier. Spawning and settlement did not appear to be coupled. Preliminary results indicated that the first evidence of starfish settlement occurred on August 5, peaked by August 12, and was over by August 26. The main scallop spat settlement occurrred in early September and had peaked by September 9. However, in 1986, scallop spat had a longer and later period of reduced settlement than in previous years.

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PUBLICATIONS

PRIMARY PUBLICATIONS

Aiken, D. E., and S. W. Waddy. 1986. Growth of the vasa deferentia of mature Homarus americanus: conflicting results from field and laboratory studies. Can. J. Fish. Aquat. Sci. 43: 1453-1457.

1986. Oocyte maturation and spawning in wild American lobsters (Homarus americanus): lack of evidence for significant regulation by photoperiod. Can. J. Fish. Aquat. Sci. 43: 1451-1453.

1986. Environmental influence on recruitment of the American lobster, Homarus americanus: a perspective. Can. J. Fish. Aquat. Sci. 43: 2258-2270.

Anderson, J. M., and R. L. Saunders. 1986. Use of photoperiod manipulation to stimualte growth of salmon parr. Atl. Salmon Federation Res. Center, Salmon Genetics Res. Prog., Tech. Rep. 65: 21 p.

Brattey, J., and A. Campbell. 1986. A survey of parasites of the American lobster, Homarus americanus (Crustacea:Decapoda), from the Canadian Maritimes. Can. J. Zool. 64: 1998-2003.

Campbell, A. 1986. Implications of size and sex regulations for the lobster fishery of the Bay of Fundy and southwestern Nova Scotia, p. 126-132. In G. S. Jamieson and N. Bourne [ed.] North Pacific Workshop on stock assessment and management of invertebrates. Can. Spec. Publ. Fish. Aquat. Sci. 92.

1986. Migratory movements of ovigerous lobsters, Homarus americanus, tagged off Grand Manan, eastern Canada. Can. J. Fish. Aquat. Sci. 43: 2197-2205.

Campbell, A., and J. Brattey. 1986. Egg loss from the American lobster, Homarus americanus, in relation to nemertean, Pseudocarcinonemertes homari, infestation. Can. J. Fish. Aquat. Sci. 43: 772-780.

Campbell, A., and D. S. Pezzack. 1986. Relative egg production and abundance of berried lobsters, Homarus americanus, in the Bay of Fundy and off southwestern Nova Scotia. Can. J. Fish. Aquat. Sci. 43: 2190-2196

Campbell, A., and A. B. Stasko. 1986. Movements of lobsters (Homarus americanus) tagged in the Bay of Fundy, Canada. Mar. Biol. 92: 393-404.

Craig, W. E., J. C. Roff, and D. J. Wildish. 1986. Pelagic-benthic energy coupling at the mouth of the Bay of Fundy. Ophelia 26: 165-180.

Eagles, M. D., D. E. Aiken, and S. L. Waddy. 1986. Influence of light and food on larval American lobsters, Homarus americanus. Can. J. Fish. Aquat. Sci. 43: 2303-2310.

Elner, J. K., and S. Ray. 1986. pH profiles from diatom stratigraphics in sediment cores of selected lakes of New Brunswick and Nova Scotia, Canada. Water Air Soil Pollut. 32: 17-29.

Emerson, C. W., J. C. Roff, and D. J. Wildish. 1986. Pelagic-benthic energy coupling at the mouth of the Bay of Fundy. Ophelia 26: 165-180.

Farrell, A. P., R. L. Saunders, H. C. Freeman, and T. P. Mommsen. 1986. Arteriosclerosis in Atlantic salmon: effects of dietary cholesterol and maturation. Arteriosclerosis 6: 453-461.

Glebe, B. D., and R. L. Saunders. 1986. Genetic factors in sexual maturity of cultured Atlantic salmon (Salmo salar) parr and adults reared in sea cages, p. 24-29. In D. J. Meerburg (ed.) Salmonid age at maturity. Can. Spec. Publ. Fish. Aquat. Sci. 89.

Iles, T. D. 1986. Defining Darwinism. Nature (Lond.) 323: 576.

Koeller, P. A., P. C. F. Hurley, P. Perley, and J. D. Neilson. 1986. Juvenile fish surveys on the Scotian Shelf: Implications for year-class size assessments. J. Cons. Cons. Int. Explor. Mer. 43: 59-76.

Korsgaard, B., T. P. Mommsen, and R. L. Saunders. 1986. The effect of temperature on the vitellogenic response in Atlantic salmon post-smolts (Salmo salar). Gen. Comp. Endocrinol. 62: 193-201.

McLeese, D. W., and S. Ray. 1986. Toxicity of $CdCl_2$, CdEDTA, $CuCl_2$ and CuEDTA to marine invertebrates. Bull. Environ. Contam. Toxicol. 36: 749-755.

Melvin, G. D., M. J. Dadswell, and J. D. Martin. 1986. Fidelity of American shad, Alosa sapidissima (Clupeidae), to its river of previous spawning. Can. J. Fish. Aquat. Sci. 43: 640-646.

Neilson, J. D., and G. H. Geen. 1986. First-year growth rate of Sixes River chinook salmon as inferred from otoliths: effects on mortality and age at maturity. Trans. Am. Fish. Soc. 115: 28-33.

Neilson, J. D., R. I. Perry, P. Valerio, and K. G. Waiwood. 1986. Condition of Atlantic cod Gadus morhua larvae after the transition to exogenous feeding: morphometrics, buoyancy and predator avoidance. Mar. Ecol. Prog. Ser. 32: 220-235.

Peterson, R. H., and D. J. Martin-Robichaud. 1986. Growth and major inorganic cation budgets of Atlantic salmon alevins at three ambient acidities. Trans. Am. Fish. Soc. 115: 220-226.

1986. Perivitelline and vitelline potentials in teleost eggs as influenced by ambient ionic stength, natal salinity, and electrode electrolyte; and the influence of these potentials on cadmium dynamics within the egg. Can. J. Fish. Aquat. Sci. 43: 1445-1450.

Prowse, T. D., and R. L. Stephenson. 1986. The relationship between winter lake cover, radiation receipts and the oxygen deficit in temperate lakes. Atmosphere-Ocean 24: 386-403.

Saunders, R. L. 1986. The scientific and management implications of age and size at sexual maturity in Atlantic salmon (Salmo salar), p. 3-6. In D. J. Meerburg (ed.) Salmonid age at maturity. Can. Spec. Publ. Fish. Aquat. Sci. 89.

Stephenson, R. L., F. C. Tan, and K. H. Mann. 1986. Use of stable carbon isotope ratios to compare plant material and potential consumers in a seagrass bed and a kelp bed in Nova Scotia, Canada. Mar. Ecol. Prog. Ser. 30: 1-7.

Strong, M. B., J. D. Neilson, and J. J. Hunt. 1986. Aberrant crystallization of pollock (Pollachius virens) otoliths. Can. J. Fish. Aquat. Sci. 43: 1457-1463.

Waddy, S. L, and D. E. Aiken. 1986. Multiple fertilization and consecutive spawning in large female lobsters, Homarus americanus. Can. J. Fish. Aquat. Sci. 43: 2291-2294.

Waddy, S. L., D. E. Aiken, and T. M. Hatt. 1986. Intermolt insemination in the American lobster, Homarus americanus. Am. Zool. 26: 80A.

Waiwood, B. A., V. Zitko, K. Haya, L. E. Burridge, and D. W. McLeese. 1986. Uptake and excretion of zinc by several tissues of the lobster (Homarus americanus). Environ. Toxicol. Chem. 6: 27-32.

White, A. W. 1986. High toxin content in the dinoflagellate Gonyaulax excavata in nature. Toxicon. 24: 605-610.

Wildish, D. J., D. L. Peer, and D. A. Greenberg. 1986. Benthic macrofaunal production in the Bay of Fundy and the possible effects of a tidal power barrage at Economy Point-Cape Tenney. Can. J. Fish. Aquat. Sci. 43: 2410-2417.

SCIENTIFIC AND TECHNICAL REPORTS

Buerkle, U. 1986. Results of the 1985 winter acoustic survey of NAFO Div. 4WX herring stocks. CAFSAC Res. Doc. 86/47: 15 p.

Campbell, A. 1986. On the change in fishing season in Lobster District 1 (36). CAFSAC Res. Doc. 86/49: 27 p.

Dadswell, M. J., and R. A. Rulifson. 1986. Sea level change and ocean climate: Its effect on fisheries resources in the Bay of Fundy and Gulf of Maine. Acadia Cent. Estuarine Res. Publ. 1: 109-121.

Elner, R. W., and D. A. Robichaud. 1986. Assessment of the fishery for snow crab off the Atlantic coast of Cape Breton Island in 1985. CAFSAC Res. Doc. 86/10: 30 p.

Gavaris, S., and K. Waiwood. 1986. Assessment of haddock in Division 5Z. CAFSAC Res. Doc. 86/87: 34 p.

Hunt, J. J. 1986. Results of Canada-USSR silver hake otolith exchange. NAFO SCR Doc. 86/18: 3 p.

Hunt, J. J., and S. Gavaris. 1986. Status of the Atlantic cod stock on Georges Bank, NAFO Division 5Z and Subarea 6 in 1985. CAFSAC Res. Doc. 86/95: 49 p.

Hunt, J. J., G. Martin, and G. A. Chouinard. 1986. The effect of freezer storage on herring length and maturity stage determination. CAFSAC Res. Doc. 86/89: 13 p.

Iles, T. D. 1986. Interaction of external and internal factors in relation to recruitment. NAFO SCR Doc. 86/119: 24 p.

Koeller, P. A., P. Perley, and J. D. Neilson. 1986. Canadian juvenile silver hake abundance estimates from joint Canada-USSR surveys on the Scotian Shelf. NAFO SCR Doc. 86/54: 11 p.

Lacroix, G. L., and K. T. Kan. 1986. Speciation of aluminum in acidic rivers of Nova Scotia supporting Atlantic salmon: a methodological evaluation. Can. Tech. Rep. Fish. Aquat. Sci. 1501: iii + 12 p.

Maynard, D. R., and D. A. Robichaud. 1986. Short-term movements of snow crabs Chionoecetes opilio) in Bay of Islands, Newfoundland, as monitored by ultrasonic tracking. CAFSAC Res. Doc. 86/50: 15 p.

Neilson, J. D., and P. Hurley. 1986. Stock structure of American plaice, witch and winter flounder in the Gulf of Maine area: implications for management. CAFSAC Res. Doc. 86/63: 35 p.

Neilson, J. D., P. Hurley, and R. I. Perry. 1986. Stock structure of yellowtail flounder in the gulf of Maine area: implications for management. CAFSAC Res. Doc. 86/64: 28 p.

Neilson, J. D., and P. Perley. 1986. A review of the status of the 4VWX flatfish stocks (exclusive of the halibuts). CAFSAC Res. Doc. 86/48: 31 p.

Perry, R. I., and P. C. F. Hurley. 1986. Circulation and potential ichthyoplankton dispersal in the Gulf of Maine, Browns, and Georges Bank areas. CAFSAC Res. Doc. 86/37: 16 p.

Peterson, R. H., and D. J. Martin-Robichaud. 1986. Aquatic insect histories and Atlantic salmon fry diets in the St. Croix River, New Brunswick, Canada. Can. Tech. Rep. Fish. Aquat. Sci. 1485: iii + 27 p.

Peterson, R. H., D. Townsend, and D. J. Martin-Robichaud. 1986. Water chemistry of 145 New Brunswick and Nova Scotia headwater lakes. Can. Tech. Rep. Fish. Aquat. Sci. 1493: iii + 36 p.

Power, M. J., and R. L. Stephenson. 1986. An analysis of logs from the 1985 4X summer purse seine fishery. CAFSAC Res. Doc. 86/44: 35 p.

Rivard, D., and S. Gavaris. 1986. A non-equilibrium production model for Divisions 4RST redfish. CAFSAC Res. Doc. 86/99: 11 p.

Robichaud, D. A., R. F. J. Bailey, and R. W. Elner. 1986. The predatory behaviour of cod (Gadus morhua) and skate (Raja radiata) on crab prey species (Chionoecetes opilio, Hyas araneus, and H. coarctatus). ICES C.M. 1986/G:47: 32 p.

Scott, J. S. 1986. Program of research by Canada (Scotia-Fundy) in the NAFO area for 1986. NAFO Circ. Lett. 86/36: 4 p.

Scott, J. S. 1986. Canadian Research Report, 1985. Section II: Scotia-Fundy Region. NAFO SCS Doc. 86/8: 5 p.

Sinclair, M., and T. D. Iles. 1986. Population richness of marine fish species. ICES C.M. 1986/M:22: 35 p

Stephenson, R. L., and M. J. Power. 1986. The 1985-86 4Vn herring biological update. CAFSAC Res. Doc. 86/45: 13 p.

Stephenson, R. L., M. J. Power, and T. D. Iles. 1986. Assessment of the 1985 4WX herring fishery. CAFSAC Res. Doc. 86/43: 46 p.

Waiwood, K. G., J. Penttila, N. McFarlane, N. Munroe, and S. Gavaris. 1986. 1986 Canada/USA age comparisons for 5Z haddock. CAFSAC Res. Doc. 86/86: 11 p.

Wildish, D. J. (Ed.) 1986. Fluxes of particulate matter across benthic boundaries: a workshop report. Can. Tech. Rep. Fish. Aquat. Sci. 1458: iv + 19 p.

Wildish, D. J., J. D. Martin, A. J. Wilson, and A. M. DeCoste. 1986. Hydrographic and sedimentary conditions in the L'Etang Inlet during 1985. Can. Tech. Rep. Fish. Aquat. Sci. 1473: iii + 14 p.

Young-Lai, W.W., and D. E. Aiken. 1986. Biology and culture of the giant scallop (Placopecten magellanicus): a review: Can. Tech. Rep. Fish. Aquat. Sci. 1478: 21 p.

Zitko, V. 1986. Multicompartment models of uptake and excretion of chemicals. Can. Tech. Rep. Fish. Aquat. Sci. 1421: iii + 8 p + Appendix.

1986. Multidimentional data display by nonlinear mapping. Can. Tech. Rep. Fish. Aquat. Sci. 1428: iii + 10 p + Appendix.

INTERPRETIVE PUBLICATIONS

Aiken, D. E. 1986. Summary of session 7: factors affecting growth and reproduction. Can. J. Fish. Aquat. Sci. 43: 2391.

Caddy, J. F., and A. Campbell. 1986. Summary of session 9: research recommendations. Can. J. Fish. Aquat. Sci. 43: 2394-2396.

Campbell, A. 1986. Introduction to the International Workshop on lobster recruitment. Can. J. Fish. Aquat. Sci. 43: 2064-2065.

Carrothers, P. J. G. 1986. (Book Review): von Brandt, A. 1984. Fish catching methods of the world. 3rd Edition. Fishing New Books, Farnham. Fish. Res. 4: 176-180.

1986. (Review): Klust, G., Fibre ropes for fishing gear. (FAO Fishing Manual). Fishing News Books, Farnham. Fish. Res. 4: 85-93.

Perry, R. I., and B. R. Dilke. 1986. The importance of bathymetry to seasonal plankton blooms in Hecate Strait, B.C., p. 278-296. In: Bowman, M. J., C. M. Yentsch, and W. T. Peterson [ed.]. Tidal Mixing and Plankton Dynamics. Springer-Verlag, NY.

Saunders, R. L. 1986. Prologue and acknowledgments, p. 1. In: D. J. Meerburg (ed.) Salmonid age at maturity. Can. Spec. Publ. Fish. Aquat. Sci. 89.

POPULAR AND MISCELLANEOUS ARTICLES

Aiken, D. E. 1986. Answering the lobby question. Can. Aquacult. Mag., Spring 1986, p. 27.

1986. Chill waters test mettle of Fundy salmon farmers. Can. Aquacult. Mag., Fall 1986, p. 27-29

(ed.). 1986. Bull. Aquacult. Assoc. Can. 86-1, 11 p.

(ed.). 1986. Bull. Aquacult. Assoc. Can. 86-2, 26 p.

(ed.) 1986. Bull. Aquacult. Assoc. Can. 86-3, 48 p.

1986. The B.C. salmon culture industry. Bull. Aquacult. Assoc. Can. 86-3: 4-13.

Dadswell, M. J. 1986. The American shad. Underwater World, DFO Fact Sheet FS 41-33/49-1986E, 8 p.

Dadswell, M. J., R. A. Rulifson, and G. R. Daborn. 1986. Potential impact of large-scale tidal power developments in the upper Bay of Fundy on fisheries resources of the northwest Atlantic. Fisheries (Bethesda) 11 (4): 26-35.

Perry, R. I., and J. D. Neilson. 1986. Vertical distribution of juvenile cod and haddock in mixed and stratified waters of Georges Bank. EOS 67: 985 (Abstract).

Rulifson, R. A., M. J. Dadswell, and G. K. Mahoney. 1986. Draft American Fisheries Society policy on tidal power development and estuarine and marine environments. Fisheries (Bethesda) 11 (4): 36-39.;

SEMINARS

Speaker	Topic
Dr. Bruce MacDonald Department of Biology University of New Brunswick Saint John, N. B.	Production and resource partitioning in giant scallop, Placopecten magellanicus, grown on bottom and in suspended culture.
Dr. Finn Sander Fisheries and Environmental Sciences Division Biological Station St. Andrews, N.B.	Barbados: Paradise lost?
Dr. G. R. South Executive Director Huntsman Marine Laboratory St. Andrews, N. B.	Amphi-Atlantic questions in seaweed distributions.
Dr. Peter Allan Brigogines Group Belgium and Dr. Jackie McGlade Bedford Institute of Oceanography Halifax, N.S.	A dynamic model of the 4X haddock fishery.
Dr. Pamela Mace Marine Fish Division Bedford Institute of Oceanography Halifax, N. S.	Harvesting dynamics of the Bay of Fundy herring purse seine fishery.
Dr. Stacia Sower Department of Zoology University of New Hampshire Durham, N.H.	Endocrinological studies of salmonid reproduction and their application in aquaculture.
Dr. Pierre Brunel Département de Sciences Biologiques Université de Montréal Montréal, Què.	Breeding season as a factor of success and population structure of outer-shelf bottom communities from two ecosystems.
Professor G. A. Knox Department of Zoology University of Canterbury Christchurch, New Zealand	Twenty-five years of marine research in the McMurdo Sound Region of Antarctica by the University of Canterbury, Antarctic Research Unit. Recent advances in our understanding of the structure and functioning of estuarine ecosystems.
Dr. Michael Burt Department of Biology University of New Brunswick Fredericton, N. B.	Marine fish parasites.
Dr. Alasdair McVicar Department of Agriculture and Fisheries Aberdeen, Scotland	Current research into diseases of wild and cultivated fish in Scotland.

WORKSHOP

Dr. D. J. Scarratt (Chairman) Dept. of Fisheries and Oceans Halifax, N.S.	Aquaculture Workshop